

Translation

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PATENT COOPERATION TREATY



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference NEC03P088A	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/JP2003/010593	International filing date (day/month/year) 21 August 2003 (21.08.2003)	Priority date (day/month/year) 10 September 2002 (10.09.2002)
International Patent Classification (IPC) or national classification and IPC C01B 31/04, 31/02, 21/064		
Applicant NEC CORPORATION		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 21 August 2003 (21.08.2003)	Date of completion of this report 24 May 2004 (24.05.2004)
Name and mailing address of the IPEA/JP	Authorized officer
Facsimile No.	Telephone No.

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I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
 pages _____ 1-11 _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☒ the claims:
 pages _____, as originally filed
 pages _____, as amended (together with any statement under Article 19
 pages _____, filed with the demand
 pages _____ 1-7 _____, filed with the letter of _____ 09 January 2004 (09.01.2004)
- ☒ the drawings:
 pages _____ 1/4-4/4 _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

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V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	1-7	YES
	Claims		NO
Inventive step (IS)	Claims	1-7	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-7	YES
	Claims		NO

2. Citations and explanations

Document 1: A. V. KRASHENINNIKOV et al., "Production of Defects in Supported Carbon Nanotubes Under Ion Irradiation," Physical Review B, April 2002, Vol. 65, 165423

The inventions that are set forth in claims 1-7 pertain to methods for producing a reactive graphite-like layered material by means of (1) a step for forming an introduction site by decreasing the number of dangling bonds in the vicinity of a hole, (2) a step for introducing a molecule or atom that constitutes the graphite-like layered material into the introduction site and (3) a step for forming new bonds between the graphite-like layered material and the molecule or atom that has been introduced. However, the inventions that are set forth in claims 1-7 are not fully supported by the description, as indicated in Box VIII; therefore, it is impossible to confirm whether a reactive graphite-like layered material can be obtained by means of the abovementioned steps (1) to (3) in the light of the description. Consequently, the findings pertaining to the novelty, inventive step and industrial applicability of the inventions that are presented herein were made based upon the assumption that it is possible to obtain a

reactive graphite-like layered material by means of the abovementioned steps (1) to (3).

Document 1 cited in the international search report discloses a feature wherein a graphite-like layered material is irradiated with ions or electrons in order to form defects, whereafter the material is subjected to an annealing processes. Therein, it is understood that said annealing process, like the abovementioned (1) step for forming an introduction site, decreases the dangling bonds in the vicinity of a hole. In addition, document 1 discloses a feature wherein Stone-Wales type defects are formed by means of annealing, and it is likely that said defects are reactive, as is set forth in the description of the present application.

However, document 1 does not disclose the feature of implementing a "step for introducing a molecule or atom that constitutes the graphite-like layered material into the introduction site," such as the abovementioned step (2), after annealing, or, in other words, after the abovementioned (1) step for forming an introduction site, and this feature cannot be said to be obvious to a person skilled in the art. In addition, the feature in question is not disclosed or suggested in any of the prior art documents other than document 1 that are cited in the international search report.

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The inventions that are set forth in claims 1-7 pertain to "methods for producing a reactive graphite-like layered material." However, the description presents materials that include Stone-Wales type defects as examples of the reactive graphite-like layered material, example 1 presents a method for forming Stone-Wales type defects in graphite, and example 2 presents methods for forming Stone-Wales type defects in h-Bn. If the reactive graphite-like layered material signifies materials that include Stone-Wales type defects, then, in the light of the disclosures of the description, it is thought that after forming a two-atom hole as illustrated in fig. 2 and then forming the structure that is illustrated in fig. 3 by reducing the dangling bonds in the vicinity of the hole, it is necessary to include a step for inserting two atoms or a two-atom molecule therein. However, the claims do not make any disclosures pertaining to the feature of forming Stone-Wales type defects from two-atom holes; therefore, the relationship between the disclosures of the claims and the description is unclear.

In addition, examples 1 and 2 do not actually verify whether the materials obtained by means of the abovementioned production method have Stone-Wales type defects by means of a specific detection method or the like; likewise, the reactivity of the materials obtained by means of the production method presented in examples 1 and 2 has not been confirmed. Furthermore, it is impossible to verify whether a structure having Stone-Wales type defects or another reactive structure is actually formed by means of the production method that is set forth in claims 1-7 in the light of the disclosures in

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portions of the description other than the examples.

Consequently, the method for producing a reactive graphite-like layered material that is set forth in claims 1-7 is not disclosed in the description in the meaning of PCT Article 5, and is not fully supported by the disclosures in the description in the meaning of PCT Article 6.